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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,222	08/31/2001	Hideki Hirayama	1794-0142P	8855

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EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	8

DATE MAILED: 12/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/943,222	HIRAYAMA ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *10-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 19-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I in Paper No. 7 is acknowledged. The traversal is on the ground(s) that there is no undue burden on the examiner to consider all claims in the single application. This is not found persuasive because a serious burden exists in the differing issues likely to arise during the prosecution of the different statutory classes of the invention.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 10-18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 7.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites, "at a concentration exceeding its doping level" in line 5, but the instant specification only supports a "high concentration impurity containing nitride" on page

11. The instant specification is required to contain a written description of the claimed limitation. Appropriate corrections to the specification are required.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites "a predetermined number of times" in line 6, the term "predetermined" is indefinite.

7. Claims 1-9 and 19-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites "a low dislocation buffer" in line 1. It is unclear how a "low" dislocation buffer differs from a generic dislocation buffer, likewise for claims 2-9 and 19-26.

8. Claim 19-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 19 recites "a predetermined device structure" in line 4, the term "predetermined" is indefinite, likewise for claims 20-22.

9. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites "at a concentration exceeding its doping level" in line 5. It is unclear what a doping level.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims 1-9 and 19-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Nagahama et al (US 6,172,382).

Nagahama et al discloses a method of forming a nitride semiconductor light emitting and light receiving device, note entire reference, comprising a sapphire substrate **30** and a n-side cladding layer **14** composed of superlattices obtained by laminating one-hundred-twenty GaN layers doped with Si to $1x10^{19}/cm^3$, this reads on applicant's an impurity at a concentration exceeding its doping level, and one-hundred-twenty undoped $Al_{0.1}Ga_{0.9}N$ layers respectively by turns and a p-side cladding layer **19** composed of superlattices obtained by laminating GaN layers doped with Mg to $1x10^{20}/cm^3$ and undoped $Al_{0.1}Ga_{0.9}N$ layers (Example 27, 33 and 35). Nagahama et al also discloses forming a p-side contact layer **20** of p-type GaN doped with Mg on the p-side cladding layer **19**. Nagahama et al also discloses the super lattice structure can

nitride layers improved in crystallinity (col 2, ln 1-67) and n-impurities include IV-A,IV-B,VI-A and VI-B groups and p-impurities belong to I-A,I-B,II-A and II-B groups (col 4, ln 1-67). Nagahama et al also discloses the material of the substrate may include sapphire, SiC, or other material which are different from nitride semiconductors and are known for growing nitride semiconductors such as GaAs (col 55, ln 35-67).

Nagahama et al is silent to the superlattice of doped and an undoped nitride layers is a low dislocation buffer. It is inherent to Nagahama et al's superlattice to function as a low dislocation buffer because Nagahama et al discloses a superlattice with a similar structure, as applicant, used to form nitride layers improved in crystallinity.

Referring to claims 4-5, Nagahama et al discloses GaN and AlGaN, which are three-five semiconductors.

Referring to claims 6-9, Nagahama et al discloses SiC, sapphire and GaAs substrates.

Referring to claims 19-26, Nagahama et al discloses forming a p-type GaN doped with Mg on the superlattice to form a light emitting and light-receiving device, where GaN is a three-five semiconductor.

12. Claims 1-9 and 19-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Kiyoku et al (US 6,153,010).

Kiyoku et al discloses a method of forming a nitride semiconductor device, note entire reference, comprising a wafer, this reads on applicant's substrate, set in a MOVPE reaction vessel and forming a n-side cladding layer **213** having a superlattice structure by alternately stacking a total of 100 20-angstrom thick first layers, each made of n-type $Al_{0.2}Ga_{0.8}N$ doped

with Si at $5x10^{18}/cm^3$ and 20-angstrom thick second layers made of undoped GaN (Example 7). Kiyoku et al et al also discloses the threshold of a device can be decreased by performing modulated doping, where a p-die cladding layer **218** can be formed by alternately stacking first thin layers made of AlGaN doped with a Mg and second thin layers made of undoped GaN (col 23, ln 1-67). Kiyoku et al also discloses the substrate can be made of sapphire, SiC, GaAs or Si (col 7, ln 1-67). Kiyoku et al also discloses a buffer layer **81** has a distorted superlattice structure formed by alternately stacking an AlGaN doped with n-type impurity and undoped GaN layers, where a buffer with a superlattice structure can provide an n-side cladding layer having excellent crystallinity, this buffer layer reads on applicant's low dislocation buffer because of similar structure and function (col 20, ln 1-67).

Referring to claims 4-5, Kiyoku et al discloses GaN and AlGaN, which are III-V semiconductors.

Referring to claims 6-9, Kiyoku et al discloses sapphire, Si, SiC and GaAs.

Referring to claims 19-26, Kiyoku et al discloses forming a Light emitting diode on buffer layer **81** (Fig 8A and col 20, ln 1-67).

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Taskar et al (US 5,786,233) teaches producing a p-doped III-V semiconductor using a p-dopant such as Mg, C or Zn (col 1).

Kikkawa et al (US 5,569,953) teaches compound semiconductor device that has a group III-V compound semiconductor that is doped with oxygen to concentration of $1x10^{19}/cm^3$ (col 4).

Kondow et al (US 5,937,274) teaches III-V alloy semiconductors can be epitaxially grown on Si substrate without generating misfit dislocations (col 12).

Goetz et al (US 6,441,393) teaches Si and Oxygen dopants and a layered superlattice structure comprising InGaN, AlGaN and AlGaInN doped with different donors and these layers with undoped layers in between (col 3-4).

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
December 4, 2002

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